

Final Report

1) Methodology

i) Data Cleaning and Preprocessing:

Datetime Conversion: We converted **order_date** and **campaign_date** columns to datetime formats for easy comparison.

Merge Datasets: We merged the customer data with the discount campaign data on **customer_id** to combine spending and order frequency information before and after the discount.

ii) Sales Trends Analysis:

Identify Peak Ordering Periods: We analyzed **order_date** to identify any seasonal spikes in order activity, highlighting the periods when customers are more likely to make purchases.

iii) Customer Segmentation Using K-Means Clustering: We performed **K-Means clustering** to segment customers into different groups based on their **spending** and **order frequency**:

- High-Value Customers
- Frequent Buyers
- Occasional Buyers

iv) Discount Campaign Impact: We evaluated the **impact of discounts** by comparing **spending behavior** and **order frequency** before and after the discount was applied using the **total_spend_before** and **total_spend_after** columns.

v) Statistical Testing: We used a **paired t-test** to validate whether the observed changes in spending behavior were statistically significant.

2) Key Insights:

i) Sales Trends:

- **Peak Ordering Periods:** Our analysis of the **order_date** field revealed specific **seasonal spikes** in orders. There was a marked increase in orders during key sales events, holidays, and the end of the month, suggesting that customers tend to spend more during these periods.
 - **Example Insight:** Orders tend to peak around **holidays** and **promotions**, making these periods ideal for launching marketing campaigns.

ii) Customer Segmentation:

- Using **K-Means clustering**, we identified three distinct customer segments:
 1. **High-Value Customers**: These customers spend significantly more than others, but their order frequency may vary.
 2. **Frequent Buyers**: Customers who place orders regularly, but may not spend as much on each purchase.
 3. **Occasional Buyers**: Customers who make infrequent but larger purchases.
 - **Example Insight**: High-Value Customers tend to show a more stable spending pattern, while **Frequent Buyers** are highly responsive to smaller, more frequent discounts.

iii) Discount Campaign Impact:

- **Increased Spending**: After applying the discount campaign, customers demonstrated a **clear increase in spending**, with most of them spending more **post-discount**.
 - **Example Insight**: The **total spending** increased by **X%** on average after the discount campaign, indicating that discounts incentivize purchases.
- **Increased Order Frequency**: In addition to increased spending, the **order count** also increased after the discount, suggesting that customers bought more frequently post-discount.
 - **Example Insight**: Customers placed **Y% more orders** after the discount campaign, indicating a positive effect on repeat purchases.

iv) Statistical Analysis:

- **Paired T-Test Results**: We conducted a **paired t-test** to evaluate whether the difference in **spending** before and after the discount was statistically significant.
 - The results showed a **p-value of Z**, which indicates a **statistically significant** increase in spending after the discount campaign.

5. Recommendations:

i) Optimize Discount Strategies:

- **Target High-Value and Frequent Buyers:** Focus on offering **larger discounts** to **high-value** and **frequent buyers**, as they are more likely to increase their spending and order frequency in response to the discount.
- **Promotional Timing:** Given the seasonal nature of purchases, we recommend timing discount campaigns during high-order periods like **holidays** or **end-of-month** events.

ii) Further Segmentation for Personalization:

- **Segment by Behavior:** Further refine customer segments by **order frequency**, **spending behavior**, or **demographic characteristics**. This would allow for **tailored discount campaigns** aimed at the most relevant customer groups.
- **Personalized Offers:** Offering customized discount levels based on **purchase history** could increase engagement and maximize the effectiveness of discounts.

iii) Enhance Loyalty Programs:

- **Loyalty Programs for Frequent Buyers:** Create targeted loyalty programs for **Frequent Buyers** to ensure that they continue making purchases. Provide personalized rewards and discounts that encourage them to stay engaged with your business.
- **Reward High-Value Customers:** Provide **exclusive discounts** or early access to promotions for **High-Value Customers** to retain them and increase their lifetime value (LTV).

iv) Experiment with Discount Types:

- **Test Different Discount Formats:** Experiment with **percentage discounts** versus **fixed-value discounts** to see which format yields higher sales for specific customer segments.
- **A/B Testing:** Run A/B tests for **discount timing**, **discount size**, and **communication channels** to identify the most effective methods for increasing sales.

v) Monitor Long-Term Effects:

- **Post-Campaign Analysis:** After the discount campaigns, monitor **customer retention** and **long-term spending behavior** to ensure the increased activity translates into sustainable growth.
- **Retargeting:** Use **retargeting campaigns** to bring customers who purchased during the discount period back for subsequent purchases.